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A search for long-living di-nuclear systems, which are transiently created during $^{238}U+^{238}U$ collisions at beam energies between 6.09A and 7.35A MeV, has been performed at GANIL using the spectrometer VAMOS.
For giant di-nuclear systems like U+U the fission barrier is no longer existing due to the strong Coulomb repulsion. Due to the absence of the fission barrier one would expect that the lifetime of the di-nuclear system is very short (about 10^{-22}s). However, the neutrons and protons are embedded in the nuclear potential, and hence, are moving in a potential with a strong barrier. Protons, which are unbound by about 5 MeV in such a system, when evaluated by a liquid drop model, feel a much higher barrier of about 35 MeV. Therefore, the individual nucleons will move in this potential pocket and will flow from one U core to the other, thus forming a giant composite system. Thereby, in such a model, the energy from the collective movement can be transformed into excitation energy via nuclear friction. In the present work, the spectrometer VAMOS was tuned for observing kinematics of deep inelastic reactions. Theoretical calculations indicate that if a long-living component would exist for this reaction, the reaction features would be a large transfer of nucleons associated with a large loss of kinetic energy. The mass flow and energy dissipation in U+U collisions at 7.42A MeV has been already investigated in ref. [1]. From our work we present reactions with such characteristics for different beam energies and compare them with theoretical model calculations [2].

[1] H. Freiesleben et al., Z.Phys. A 292 (1979) 171
[2] V.I. Zagrebaev et al., Phys.Rev. C 65 (2001) 014607